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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/735,862	12/12/2003	Hong Po	NU-208WO-1	3189
38731	7590	12/23/2004	EXAMINER	
NUFERN			PAK, SUNG H	
7 AIRPORT PARK ROAD			ART UNIT	PAPER NUMBER
EAST GRANBY, CT 06026			2874	

DATE MAILED: 12/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 10/735,862	Applicant(s) PO ET AL.	
	Examiner Sung H. Pak	Art Unit 2874	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-96 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-96 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>1004</u> . | 6) <input type="checkbox"/> Other: ____.  |

## **DETAILED ACTION**

### ***Information Disclosure Statement***

Information disclosure statement filed 10/14/2004 has been considered by the examiner.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-29, 31-64, 66-71, 85-96 are rejected under 35 U.S.C. 103(a) as being unpatentable over MacCormack et al (US 6,407,855 B1).

MacCormack discloses an optical fiber with all the limitations set forth in the claims, except it does not explicitly teach the use of more than two pairs of reflectors overlapping in a manner claimed in the instant application.

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Specifically, MacCormack discloses a system comprising an optical fiber comprising a gain medium having a Raman active material with a Raman gain spectrum, the optical fiber being configured to receive energy at a pump wavelength  $\lambda_p$  (abstract); at least two pairs of reflectors disposed in the optical fiber, each pair of reflectors forming a resonance cavity with a resonance frequency, each resonance cavity having an index, the index of each resonance cavity being different than the index of the other resonance cavities (Fig. 4, column 8 lines 42-48); wherein for a resonance cavity having an index with a value M, M being an integer having a value of at least one, the resonance cavity has a resonance frequency  $(c/\lambda_{sm})$ , where  $\lambda_{sm}^{-1} = \lambda_p^{-1} - \Sigma_M \lambda_{rm}^{-1}$ , wherein  $(c/\lambda_{rm})$  is a frequency within the Raman gain spectrum of the Raman active material contained in the gain medium and c is the speed of light (column 5 lines 4-19); and for a resonance cavity having an index with a value N, N being an integer having a value of at least 2, the resonance cavity has a resonance frequency  $(c/\lambda_{sn})$ , the resonance cavity having the index with the value N overlapping only with a resonance cavity having a resonance frequency  $(c/\lambda_{s(n-1)})$  and with a resonance cavity having a resonance frequency  $(c/\lambda_{s(n+1)})$  wherein the resonance cavity having the highest value for N overlaps with at most one other resonance cavity (Fig. 4 and column 8 line 42- column 9 line 3); wherein at least one pair of reflectors has a first reflector and a second reflector, the first reflector being disposed in the optical fiber closer to a point where energy at wavelength  $\lambda_p$  enters the optical fiber than the second reflector, the second reflector being configured to reflect only a portion of energy impinging thereon at the resonance frequency for the resonance cavity formed by the at least one pair of reflectors (column 8 line 42- column 9 line 3); wherein the first reflector is configured to reflect substantially all energy impinging thereon at the resonance frequency for the resonance cavity formed by the at least one

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pair of reflectors, and the second reflector is configured to partially reflect of the energy impinging thereon so that it acts as an output coupler (column 8 lines 42- column 9 line 3); wherein there is an additional reflector disposed in the optical fiber, the additional reflector being configured to reflect energy impinging thereon at wavelength  $\lambda_p$  (Fig. 4); wherein at least one of the pairs of reflectors comprise pairs of Bragg gratings (column 5 lines 35-36).

Regarding claims 88-91, MacCormack discloses controlling the power of output wavelength relative to the power of the pump wavelength (column 6 lines 5-24).

Regarding claims 13, 21, 54, MacCormack discloses the use of wavelength tunable reflectors (column 2 lines 28-29).

Regarding claims 22, 23, 55-57, MacCormack discloses the use of long period grating for suppressing formation of energy at frequency in Raman gain spectrum of the active material in the gain medium in the fiber (column 6 lines 5-24).

However, MacCormack discloses the use of two pairs of reflectors in this configuration (Fig. 4). Nevertheless, it is well known and common in the art to use three or more pairs of reflective gratings in Raman fiber lasers. Plurality of pairs of reflective gratings provide plurality of resonance cavities which enable the fiber laser to output plurality of wavelengths for more robust optical applications. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the MacCormack device to have more than three pairs of reflective gratings.

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Claims 72-84 are rejected under 35 U.S.C. 103(a) as being unpatentable over MacCormack et al (US 6,407,855 B1) in view of Dianov et al ("Three-cascaded 1407-nm Raman Laser Based on Phosphorus-doped Silica Fiber").

Dianov was cited in the information disclosure statement.

MacCormack discloses an optical fiber device with all the limitations set forth in the claims as discussed above, except it does not explicitly teach the use of  $\text{GeO}_2$  and/or  $\text{P}_2\text{O}_5$  as Raman active materials.

Dianov, on the other hand, explicitly teaches the use of  $\text{GeO}_2$  and  $\text{P}_2\text{O}_5$  as Raman active materials in optical fiber lasers (abstract). It is taught that the use of  $\text{GeO}_2$  and  $\text{P}_2\text{O}_5$  are advantageous and desirable because the resulting optical fiber lasers are able to generate optical signal with desirable wavelengths with few number of conversion cascades (page 402, paragraph 3). Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the MacCormack device to have  $\text{GeO}_2$  and  $\text{P}_2\text{O}_5$  as Raman active materials.

### ***Conclusion***

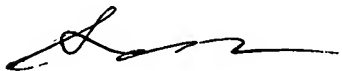
The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US 5323404, US 6163552, US 6310899, US 5815518 disclose optical fiber lasers with cascaded Bragg gratings.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sung H. Pak whose telephone number is (571) 272-2353. The examiner can normally be reached on Monday- Friday, 9AM-5PM.

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The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Sung H. Pak  
Examiner  
Art Unit 2874

sp